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THESIS

EVALUATION OF USER INFORMATION SATISFACTION OF THE COMPOSITE HEALTH CARE SYSTEM

by

Lyn Eric Hurd

March, 1991

Thesis Advisor: Moshe Zviran

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EVALUATION OF USER INFORMATION SATISFACTION OF THE COMPOSITE HEALTH CARE SYSTEM

by

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Submitted in partial fulfillment
of the requirements for the degree of

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from the

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ABSTRACT

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I. INTRODUCTION

A. OVERVIEW

Organizations of all types are seeking to improve their effectiveness and efficiency by using information systems. Considerable amounts of time and money are spent to develop and implement information systems within an organization. Once inplemented, an information system may or may not be effective in accomplishing its objective. Thus, an important and necessary stage in justifying any particular information system is to determine its value of effectiveness to the organization.

The Department of Defense (DoD) has undertaken the development and implementation of a large information system for use at Medical Treatment Facilities. The system is called the Composite Health Care System (CHCS). Due to the costs associated with this system, a simple and efficient measure is needed to analyze the effectiveness of this information system.

Selecting the appropriate measure of system effectiveness is difficult. Much emphasis is placed in many organizations on economic analysis of information system. This type of analysis provides only an economic measure of effectiveness for a system: will the benefit outweigh the cost? If the

objective of the organization is not purely economic, the measure is not complete.

Many researchers have proposed measuring the level of satisfaction perceived by the users of the system as a surrogate measure of effectiveness. No matter how technically correct an information system, if the users are not satisfied with the system, it is not an effective system. Conversely, if the users are satisfied, the system is considered effective in meeting their needs.

B. RESEARCH OBJECTIVES

This study will investigate through empirical research whether the Composite Health Care System is effective through the use of the user information satisfaction surrogate measure. Using a previously developed, documented, and validated survey instrument, this study will describe the user information satisfaction characteristics at one implementation site of the Composite Health Care System: Naval Hospital, Charleston. The results of this survey will help pinpoint potential problem areas with the system implementation as well as document areas without problems. Once completed, the results will serve as a baseline gauge to compare satisfaction with CHCS at other facilities and to measure changes in satisfaction at Charleston at a later time.

II. DESCRIPTION OF THE COMPOSITE HEALTH CARE SYSTEM

A. BACKGROUND

The Department of Defense (DoD) has pursued the goal of providing automated computer support to its hospitals and clinics since 1968. In February 1979, the Mission Elements Need Statement (MENS), establishing the need for an automated computer system was approved. Under the direction of the Tri-Service Medical Information System (TRIMIS) program office, stand-alone and integrated health care computer systems were acquired, implemented and operated to support Pharmacy (TRIPHARM), Laboratory (TRILAB), Radiology (TRIRAD), Appointment and Scheduling (TRIPASS), Quality Assurance (AQCESS), and Hospital Information System (HIS). The knowledge and experience gained through the operation of these systems since 1979 was used to refine and validate the system requirements for a completely new and fully integrated information system: The Composite Health Care System (CHCS).

B. CHCS PURPOSE

The primary purpose of CHCS is "to provide health care services that support military forces in fulfilling their required mission...." (Draft System Decision Paper, 1989). Improving the efficiency and effectiveness of military health care delivery during peacetime and during mobilization through

integration of information resources is the goal of CHCS. The major focus of CHCS is the integration of shared information resources to resolve the deficiencies of communication, decision support, and information processing. The Composite Health Care System is designed as a fully integrated medical information system that provides automated support of information requirements for military medical treatment facilities. CHCS supports the administrative functions and the delivery of health care with information retrieval services.

C. DEPLOYMENT STATUS

CHCS is undergoing the Operational Test and Evaluation (OT&E) phase and is currently deployed to Naval Hospital Charleston as one beta-test site. The role of a beta-test site is to incrementally replace the TRIMIS systems with validated CHCS software. Continued validation of requirements and extensive evaluation of the CHCS software is conducted prior to the decision to deploy CHCS worldwide.

D. OPERATIONAL FEATURES

CHCS supports various functional areas in sharing information. Each functional area uses this information for its own purpose and communicates results/activities to other areas. Functional areas supported by CHCS include:

1. Patient Administration

Patient administration does the registration of a patient into the system. Once in the computer system, the patient's demographic information is available for access by all other modules. The patient administration module also performs the functions to admit patients to the hospital, transfer patients between wards, and discharge patients from the hospital. The creation, update and closing of inpatient records is also performed by the patient administration module.

2. Patient Appointment and Scheduling

The Patient Appointment and Scheduling module provides for a centralized appointment service, a decentralized appointment service, or a combination of both depending on the desire of the hospital. The appointment service creates and maintains the appointment schedule for the hospital. A patient is given an appointment date and time to see the health care provider creating a centralized repository of information to produce operational reports of activity.

3. Nursing

CHCS supports inpatient nursing in a variety of areas. In the area of patient care, nursing uses the system for entering and obtaining the status of all physician orders, entering patient assessment data, and generating patient care plans. Documentation of patient progress is performed in the

automated nursing notes. Nursing unit management uses CHCS to generate shift care plans, patient management reports, drug administration time reports, and staffing requirement reports. Routine administrative functions are performed by CHCS for nursing including: staff credentialling, documentation of continuing education and in-service training, and staff scheduling capabilities.

4. Laboratory

The laboratory uses the CHCS system for processing of orders for laboratory tests with automated reporting of test results. Specimens are processed, tracked, and reported through the system. All results are placed into the patients automated medical record and are immediately available for inquiry by health care providers. Automated control of blood bank operations including: blood acquisition, inventory and utilization are accomplished through CHCS. The laboratory is supported with ability to manage inventory control, register patients into the tumor registry, conduct a drug testing program, and generate a multitude of management reports.

5. Pharmacy

The pharmacy uses CHCS to process prescriptions for patients that are ordered by health care providers. The health care provider enters the prescription information at a terminal located in his office. The information is electronically transmitted to the pharmacy. The pharmacy can

immediately prepare the medication for dispensing before the patient leaves the physician's office. CHCS automatically performs checks for patient allergies, drug interactions with medications the patient is currently taking, drug dosage for the age of the patient, and records the prescription into the patient's medical record. In-patient order processing is accomplished in much the same fashion. On-line drug monographs are available for inquiry by medical staff at any terminal. Pharmacy management of inventory control and reporting are also accomplished.

6. Radiology

Orders for radiological procedures are electronically transmitted to the radiology department where the order is processed. Order tracking and results reporting are performed by the system. Radiology results are immediately available for inquiry by medical staff. Department management including inventory control is also conducted through CHCS.

7. Clinical Dietetics

The Clinical Dietetics service uses CHCS to obtain patient data needed to access the nutritional needs of the patient. This information is used to create patient diet plans, select patients of interest, patient menu selections and monitor patient nutritional data. CHCS is also used to maintain the nutrition clinic schedule and compute clinical dietetics workload data.

E. POTENTIAL BENEFITS

In general terms, the overall benefits of the CHCS system include:

1. reliable, timely, easily accessible clinical information
2. improved documentation for medicolegal issues
3. improved communication
4. improved patient satisfaction
5. improved management efficiency

III. USER INFORMATION SATISFACTION AND ITS MEASUREMENT

A. INTRODUCTION

Organizations spend considerable amounts of time and money to develop and implement information systems. However, since financial resources are scarce and limited, not all application systems can be developed. Only those applications that can be justified are approved and developed. An important and necessary stage in justifying any particular information system is to determine its value or effectiveness to the organization.

B. METHODS TO ASSESS EFFECTIVENESS

Several methods have been suggested in the empirical and non-empirical literature for assessing the effectiveness of an information system.

System usage (Swanson, 1974; Conrath and Mignen, 1990) assumes that a casual relationship exists between effectiveness of an information system and the amount of time the system is used. An effective information system is used more than a less effective system. This method also assumes that the use of the system is optional to the user. If, however, the use of the system is mandatory, the relationship between use and effectiveness fails.

Others (eg., Hamilton and Chervany, 1981) argue that effectiveness is determined by comparing performance to ojbectives. To assess the effectiveness of an information system, the task objective of the system is first determined. Criterion measures are developed to measure the extent to which the information system accomplishes the determined objectives. Problems are encountered with this method because: objectives and measures are often not defined adequately; efficiency-oriented and easily employed measures are frequently used over effectiveness-oriented and difficult measures; individual interpretations of what the ojectives and measures are, often conflicting, exist.

Another method frequently used to determine the value of an information system is by economic (cost-benefit) evaluation. The benefits of a system, by improved organizational effectiveness, are weighed against the cost for development and operation of the system (Nolan, 1974). Although this appears objective and comprehensive on paper, in practice, cost-benefit analysis is highly subjective and difficult to conduct (Nolan, 1974). The difficulties in using this approach for research argued by Ives et al. (1983) stem from the fact that: (1) many costs and benefits are intangible and not easily recognizable and/or converted into monetary equivalents, (2) unstructured, ad hoc decision making benefits are nearly impossible to objectively assess, (3) even when these items are determined by an organization, the data are

generally unrecorded and not available for research (Ives et al., 1983).

Theoretically, evaluation of the effectiveness of an information system is best accomplished by decision analysis, based on its degree of use in decision making and the resultant productivity benefits attributable to its use (Nolan, 1974). An effective information system supports a user by retrieving necessary information in the proper format, level of detail, and at the proper frequency for use. However, the decision analysis approach suffers a significant drawback for use in scientific research: it is non-quantifiable and cannot be easily replicated.

C. THE USER INFORMATION SATISFACTION CONSTRUCT

A surrogate for utility in decision making is the satisfaction of users of the information system (Neumann and Segev, 1980; Ives et al., 1983; Bailey and Peason, 1983; Baroudi and Orlikowski, 1988).

Webster's New Collegiate Dictionary defines satisfaction as "the fulfillment of a need or want". Organizational Psychologist Bernard Bass (1965) generically defines satisfaction to mean "... the extent to which the item is rewarding to us relative to how much better we might do elsewhere and what aspirations we have."

The concept of User Information Satisfaction (UIS) can be traced back to the work of Cyert and March (1963). Their

research argues that organizational behavior continually imposes upon the manager the need for information. If a formal information system exits, the success or failure of that information system to meet the needs of the user either reinforces or frustrates the user's sense of satisfaction with that system.

Figure 3.1, an adaptation of the Cyert and March model, portrays the reinforcement/reduction of satisfaction process in decision making using the information system. When a user perceives that the needed information should be readily available in the formal information system, he will use the information system in the normal manner to retrieve the required information. If the information is readily available, satisfaction with the system will be reinforced. But, if the information is not readily available, he must adapt and conduct a search beyond the information system by ad hoc methods or by some other less familiar method.

An "expanded search" through the information system is a cause of frustration to the user because of the time and effort used to obtain the necessary information. Additionally, the user is frustrated because he perceived the information to be readily available when it was not. From users' standpoint, information systems may actually block the user from carrying out the act of decision making (Nolan, 1965).

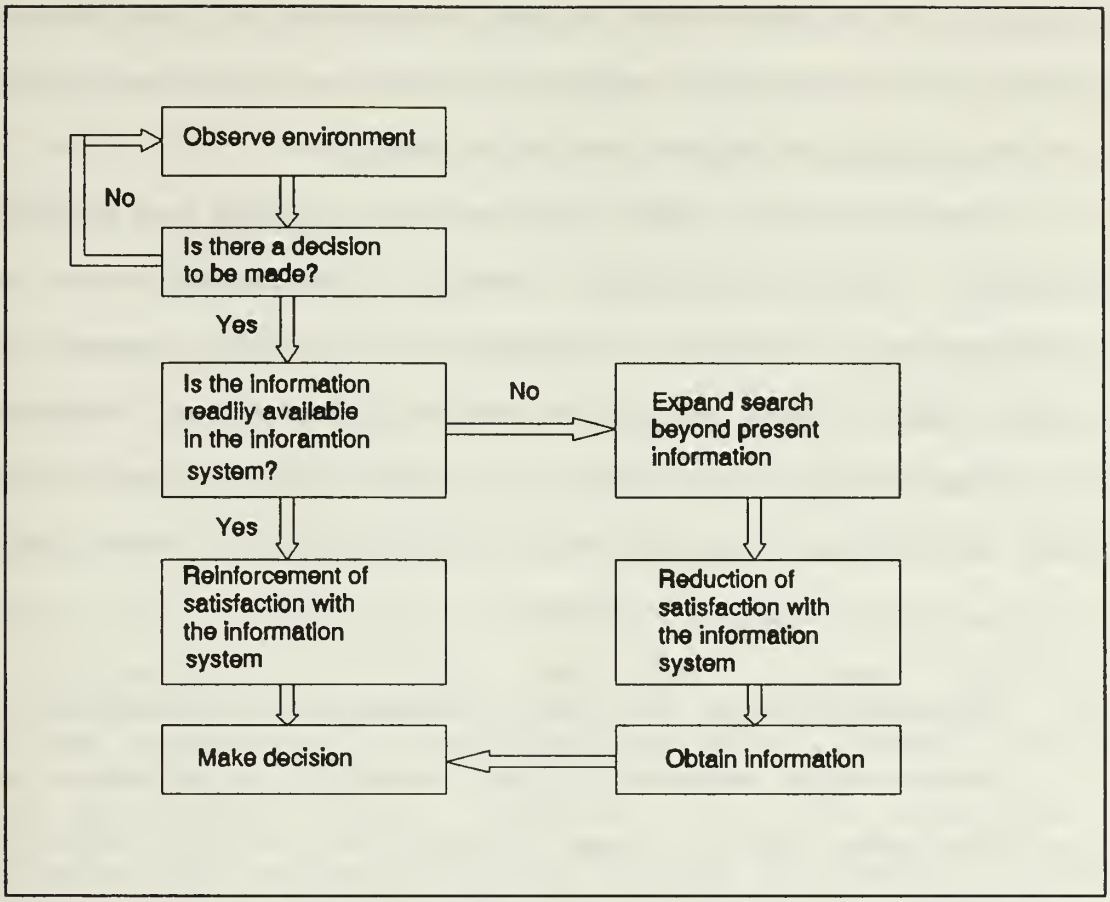

Figure 3.1
UIS reinforcement/reduction
in decision making

The information system is continually being evaluated by the user from repetitive use. If over a period of time of use, the user perceives that the information system cannot retrieve the information without the frequent use of expanded searches, frustration will occur. Consequently, this may lead to an expression of user dissatisfaction with the information system. The project is a failure if the end product does not satisfy the manager whom it is to serve (Powers and Dickson, 1973). If, however, the user is able to reliably obtain the

Figure 5.12 represents factor satisfaction of administrative personnel compared to other respondents.

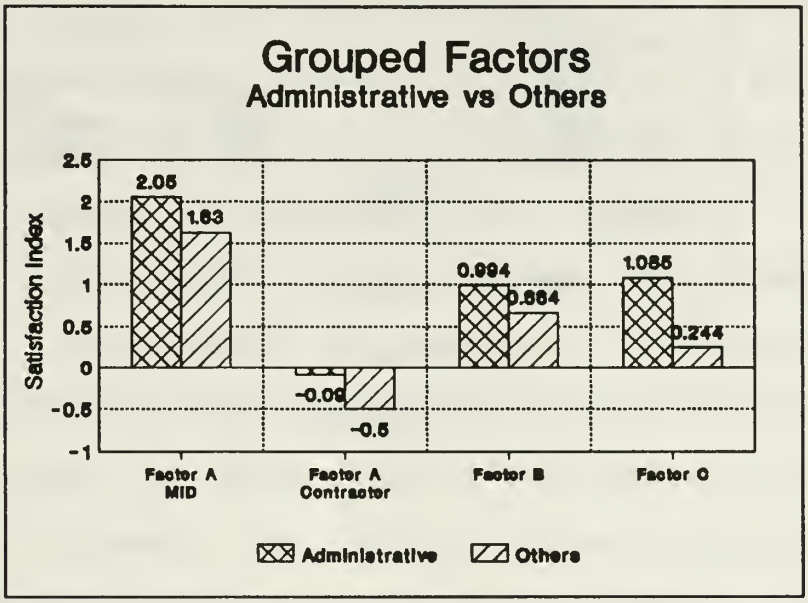

Figure 5.12

Figure 5.13 represents factor satisfaction of ancillary personnel compared to other respondents.

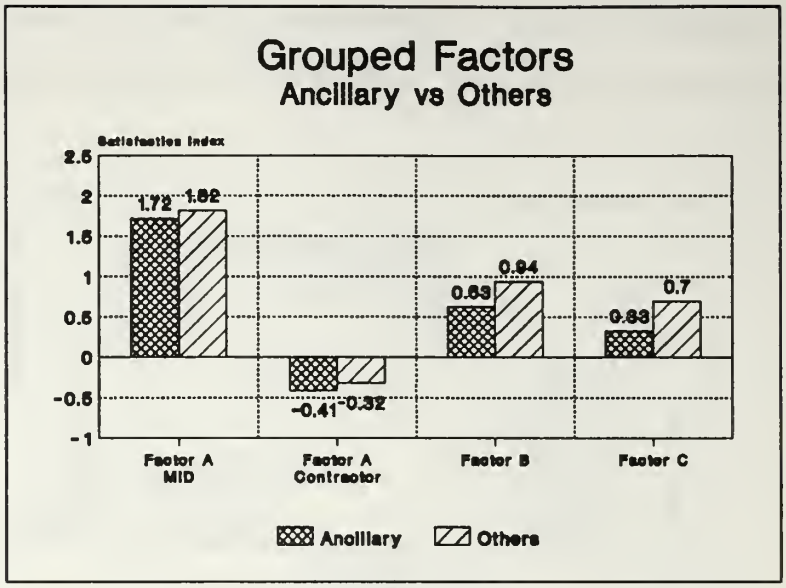

Figure 5.13

a. Factor A (Local MID Staff and Services)

This factor represents the attitude, services and relationship with the local MID personnel. As seen in Figure 5.10, the administrative personnel displayed the highest level of satisfaction. The lowest level of satisfaction, although still extremely positive, was displayed by the physicians.

b. Factor A (Contractor Services)

This factor represents the responsiveness and services of software programmers. This factor received the lowest level of satisfaction of any factor. All work groups rated this factor negatively, with ancillary personnel recording the lowest level of satisfaction of any group.

c. Factor B - Information Product

This factor represents the users perception of the quality of output from the system. Although the differences among the groups were not statistically significant, the administrative group scored the highest level of satisfaction. Ancillary members presented the lowest level of satisfaction.

d. Factor C - Knowledge and Involvement

This factor represents the respondents' self-reported assessment of the quality of training provided, their understanding of the system, and their participation in its development. There was a statistically significant difference between the level of satisfaction of the administrative group and the other respondents. Administrative personnel were highly satisfied with their knowledge and involvement of the system.

4. Time of System Use

As users become familiar with the functions of a system over time, it is expected that the more experienced users would exhibit a greater level of satisfaction.

Separating the respondents into subgroups of users with experience less than six months, six months to 11 months, and greater than 11 months provides subgroups of approximately equal size. The work groups exhibit roughly the same proportions. Figure 5.14 represents the breakdown of respondents time of system use.

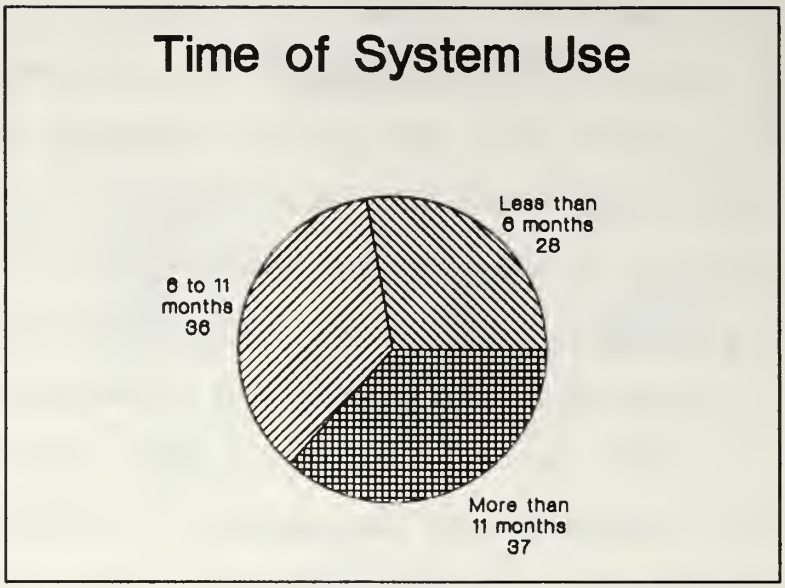

Figure 5.14

All the respondents, broken down by time of system use, demonstrate that user satisfaction did not appreciably change with the increase in experience of users. Figure 5.15 shows the level of satisfaction with CHCS verses time of system use.

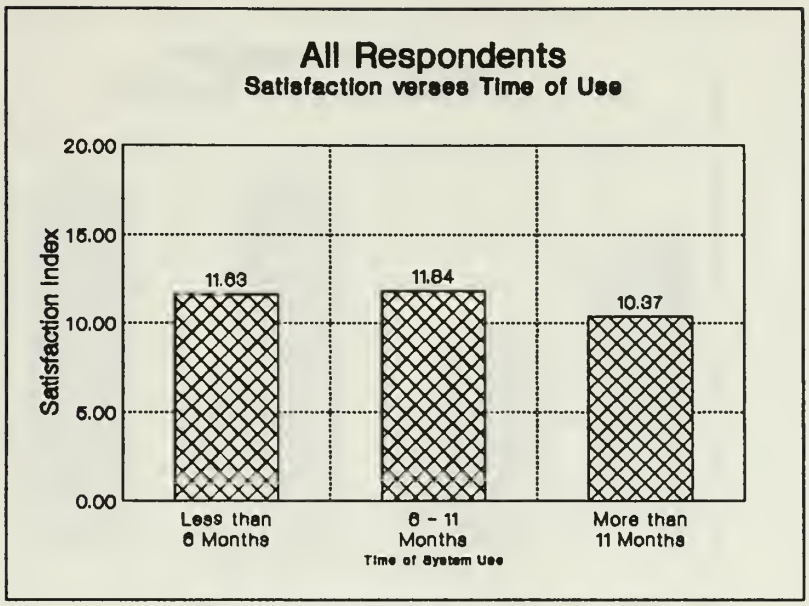

Figure 5.15

None of the work groups; administrative, physicians, or ancillary; exhibited any high correlation between time of system use and level of satisfaction of any factor by regression analysis. However, it is noteworthy to report the trends in the level of satisfaction for the work groups over time.

The administrative work group respondents with less than six months system use report a satisfaction index of 8.71. As the users gain experience with the system of six months, the level of satisfaction increases to 17.42. Satisfaction remains consistent, at 17.29, for users with greater than 11 months experience. Figure 5.16 shows the relationship of the satisfaction of administrative users to time of system use.

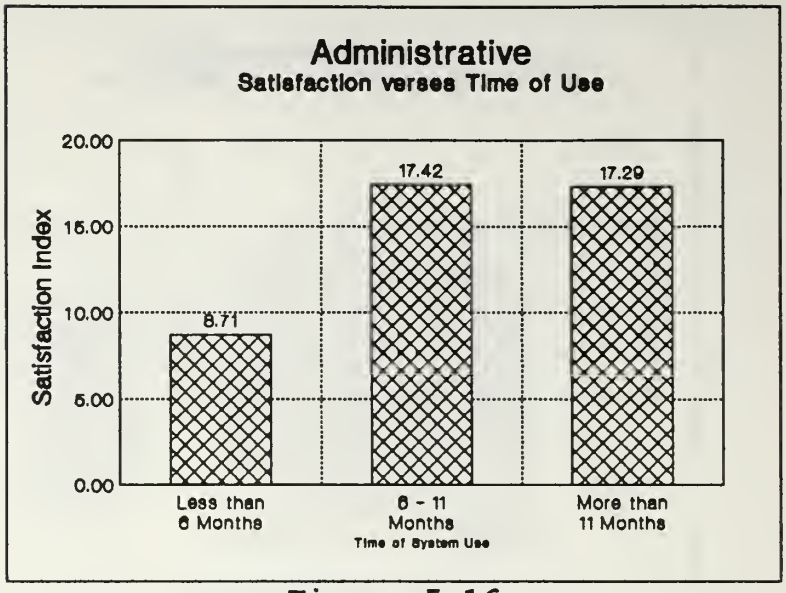

Figure 5.16

On the other hand, physicians' level of satisfaction is consistent (satisfaction index 6.50-6.37) for users up to 11 months of experience. The level of satisfaction increases for users with greater than 11 months of experience. Figure 5.17 shows physician satisfaction verses time of system use.

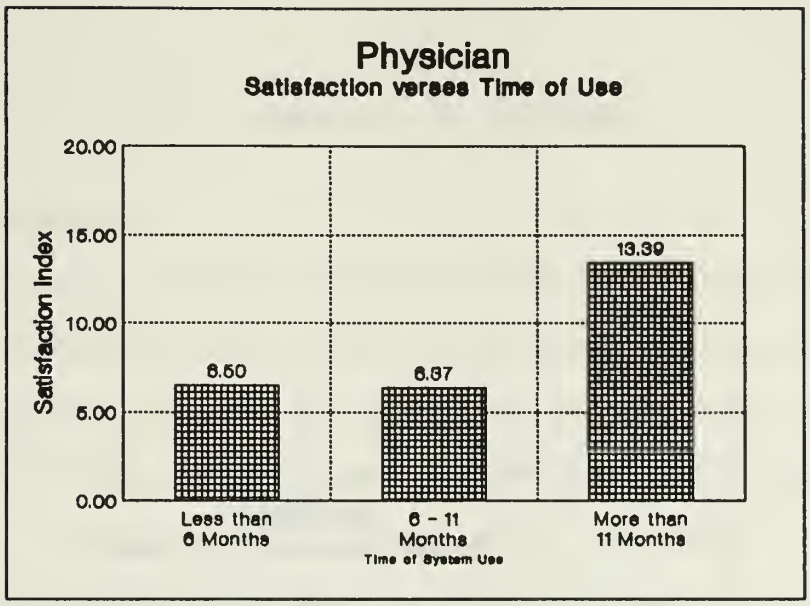

Figure 5.17

Unlike either the administrative or physician work groups, ancillary respondents with the least experience in system use demonstrated the greatest satisfaction (satisfaction index 16.90). The level of satisfaction declined to 11.44 for users with six to 11 months experience. Satisfaction further declined to 1.56 for users with greater than 11 months experience. Figure 5.18 shows the level of satisfaction verses time for ancillary users.

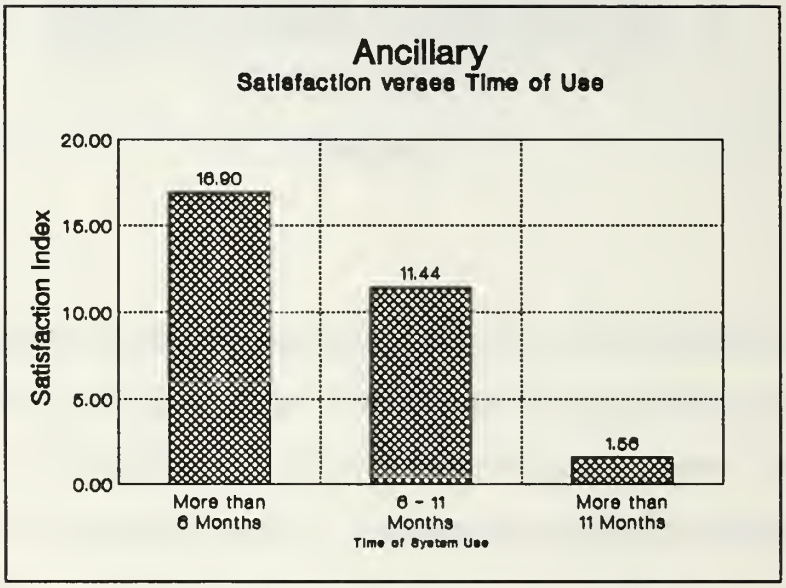
Ancillary
Satisfaction verses Time of Use
Satisfaction Index
20.00
15.00
10.00
5.00
0.00
16.90
11.44
1.56
More than
6 Months
6 - 11
Months
More than
11 Months
Time of System Use

Figure 5.18

VI. ANALYSIS OF FINDINGS

A. INTRODUCTION

The purpose of this research is to describe and document the user information satisfaction characteristics of the users of the Composite Health Care System at the Naval Hospital, Charleston. The study results are not to be seen as a definitive evaluation of CHCS, but provide a baseline reference point for identifying system strengths or possible areas of conflict and dissatisfaction. Areas identified as dissatisfying should be examined further through interviews and by examining the development and operating procedures of the work group to determine the possible causes and course of action.

The value of the satisfaction scores (positive or negative) is an important finding in itself, however, the relative comparison of scores across different groups of users is useful for the purposes of this study.

The analysis of the survey findings will primarily focus on the differences and similarities among the three work groups: administrative, ancillary, and physicians. The first section will look at the overall user information satisfaction with CHCS. The second section will discuss significant differences in individual question responses reported between

work groups. The third section will compare the three work groups with respect to the grouped factors: local MIS staff and services, contractor services, knowledge and involvement, and information product. The last section will look at user satisfaction for the three work groups from the perspective of time of system use.

B. OVERALL SATISFACTION

1. Combined Groups

The overall satisfaction index is a general description of the user's perception of CHCS as a whole. A negative result index would indicate dissatisfaction while positive results index some degree of satisfaction with the system. The survey average satisfaction index reported is 11.26. Since the overall satisfaction index ranges from -39 to 39 in scale, the respondents average overall satisfaction is characterized as slightly satisfied using the adjective qualifiers of Baroudi and Orlikowski (1988).

2. Comparison of Work Groups

The three work groups used in this study were chosen to differentiate the users by the way they primarily use the computer system. There were no significant differences found in overall satisfaction between any one work group and the remaining groups. Although all groups are considered slightly satisfied with CHCS, there are meaningful differences between the work groups' overall satisfaction.

Lowest of the work groups in overall satisfaction was the physician group (8.07). Physicians use CHCS almost exclusively for the conduct of direct patient care. The functionality of the system for physicians is the most diverse of the three groups. Requirements of computer input are different for medical record queries, prescribing medications, laboratory tests, radiology requests, and so on. The physician needs to know the procedures for each type of functionality to use the system effectively.

Each physician has a terminal located in the office. When using the system for out-patient purposes, the patient frequently is present in the office at the time of use. In addition, the medical profession have not traditionally used automated means to document patient treatments or write prescriptions in the past. The computer system can be considered, by them, an intrusion into their already busy schedule and has caused the physicians to alter their work patterns to accommodate the system.

The significant change of work habits, extensive functionality requirements, time constraints imposed on the physicians, and the presence of patients in the office while operating the system combine to make this finding not surprising.

Ancillary personnel, the largest of the work groups (46%), demonstrated a slightly higher overall satisfaction score (9.65). Most of the users in this work group are

technicians using the system to process prescriptions, laboratory specimens, or radiology requests. Ancillary areas in the hospital have had automated processing capabilities, in some form or another, for many years and are very accustomed to general computer use. Due to the large number of items processed each day in these areas, the users are under a tight time constraint to process items through the computer quickly.

The administrative group scored the highest overall satisfaction scores. Administrative personnel use the system for purposes other than for the direct conduct of patient care. With a few exceptions, the work performed on the system can be accomplished without the pressure of a limited and specific time constraint. The computer system can therefore be used at a comparatively slower pace than the other work groups. Once again with a few exceptions, most of the work performed by the administrative personnel previous to CHCS was performed manually. Automating the compilation and generation of reports can significantly reduce the time spent on these activities.

C. SIGNIFICANT INDIVIDUAL QUESTION DIFFERENCES

Although there are demonstrated differences in satisfaction among the various groups in every question, only the questions with significant differences among the work groups will be discussed in this section. The individual

questions will be combined into the grouped factors representing satisfaction in the next section.

1. Degree of Training Provided to Users

The results of the survey show the physicians were the least satisfied with the training provided, followed closely by the ancillary personnel. There is a significant increase in the satisfaction with user training expressed by the administrative personnel.

Effective user training is extremely important to the success of any computer system. The person's satisfaction with the initial user training received sets the stage for his or her satisfaction while operating the system. Often, user training is intensive only during the time a system is being implemented. After implementation new users are frequently required to learn the functionality of a computer system with On-the-job-training (OJT). Formalized training programs are difficult to conduct on a regular basis due to the constant change-over of personnel experienced at medical treatment facilities and the specialized requirements of the different work groups. Satisfaction with the degree of training provided is closely associated with the user's understanding of the system and their feeling of participation.

2. User's Understanding of the System

Users generally attain a high level of understanding of a computer system from either effective training or

experience or both. As anticipated, the work groups that reported a low level of satisfaction in user training (Physicians in particular) demonstrated a significantly lower level of satisfaction with their understanding of the system. The diverse functionality of the module used by physicians may also diminish their perception of the level of understanding.

3. User's Feeling of Participation

The user's perception of the shared involvement and commitment to the operation of the computer system is beneficial to the success of a computer system. Satisfaction with the level of participation naturally follows from the satisfaction of user training and the relationship with the MID staff. It is not surprising to observe the administrative work group scoring significantly higher than the other groups on this question.

D. GROUPED FACTORS

Baroudi and Orlikowski (1988) argue that the individual questions can be grouped into three factors, MIS staff and services, information product, and knowledge and involvement, that comprise user satisfaction. As discussed in Chapter V, the functions normally provided by a MIS of the companies studied in their research are provided by two separate entities at Naval Hospital, Charleston. Local support services are provided by the Command's Management Information Department, whereas software support is furnished by a

civilian software contractor. It is logical to divide the single factor, MIS staff and services found in the original study, to make two separate factors: local MID staff and services and Contractor's services.

The three work groups generally scored similarly in each of the four factors. The only exception being the statistically significant high level of satisfaction of the administrative group for the knowledge and involvement factor.

The most notable finding when four factors are examined is the significant negative level of satisfaction of all the work groups with the services provided by the software contractor. The services specifically asked in the questionnaire dealt with satisfaction of the time for system changes and new system development. The negative satisfaction finding for this factor is, however, expected. Bailey and Pearson (1983) list these two factors as the two most frequent for causing dissatisfaction among users; a finding supported by other published reports.

At the other end of the spectrum, the user's perception of the local MID staff and services is considered quite satisfactory. There does not appear to be any communication or attitudinal barriers to prevent an interchange of ideas between the respondents and the local MID staff.

Lower in satisfaction is the user's perception of the information product factor. The information product measures the quality of the information output provided to the user.

The three work groups combined rated this factor as slightly satisfactory. The users perceive the system positively in regards to the information's accuracy, variance, reliability, and relevancy to the intended function.

The physician and ancillary work groups displayed a positive satisfaction index for the knowledge and involvement factor. However, the satisfaction level demonstrated, albeit positive, was very close to neutrality. Administrative personnel indicated a satisfaction level significantly higher than the other two groups; high enough to be considered slightly satisfied with the factor. The combination of satisfaction with user training, system understanding, and participation is responsible for administrative work group's higher level of satisfaction..

E. SATISFACTION VERSES TIME OF SYSTEM USE

Satisfaction with a computer system is expected to improve the longer users operate a system over time; gaining more experience and understanding of the system.

An increase in overall satisfaction resulting from longer time of system use did not emerge from this study. The study did show, when considering the survey population as a whole, that user's satisfaction remained constant when compared to length of time the respondent had used the system.

As discussed in Chapter V, the Ancillary group making up 46% of the survey population tends to influence all

generalizations drawn from total survey population findings. Breaking down the findings by work groups demonstrates this fact well.

Positive trends in satisfaction for the administrative and physician work groups were displayed. Personnel in those work groups who have used the system the longest (greater than 11 months) were more satisfied with CHCS than those who had used the system less than six months.

The work performed by CHCS in the physician and administrative work groups was previously performed manually. As they worked with the system, their experience and confidence with CHCS expanded, thereby increased satisfaction was a result.

Administrative personnel, satisfied with the training provided, quickly grasped the system procedures. The structured application of CHCS to their work performed assisted in their acceptance of the system. Rapid increases in satisfaction with CHCS resulted.

The complex functionality of the physician modules is possibly responsible for their relatively prolonged time period before satisfaction is increased. After physicians learned the multitude of inputs necessary, their confidence and satisfaction with CHCS improved.

Ancillary personnel findings indicate a steady decrease in satisfaction with CHCS for those who have used the system the longest when compared to those persons having less than six

months exposure to system use. This is the opposite to what was anticipated. It is not clear why this finding occurred. An in-depth analysis of their policies and procedure along with interviews with the personnel is necessary to determine the cause of this finding.

VII. CONCLUSIONS AND RECOMMENDATIONS

A. MEASURING COMPUTER SYSTEM EFFECTIVENESS

In an environment of scarce financial resources, organizations need to measure the effectiveness of computer systems to justify expenditures. Of the several direct and in-direct methods available to measure computer system effectiveness, measurement of user information satisfaction is a suitable, available and effective surrogate measure. The previously developed and validated user information satisfaction questionnaire of Baroudi and Orlikowski (1988) is easily administered and provides sufficient responses to determine a baseline reference point for overall satisfaction as well as indicating potential problem areas. The survey is not a definitive evaluation of CHCS, but combined with further investigation, can be a powerful tool in the analysis and interpretation into the cause of user dissatisfaction.

B. SATISFACTION CHARACTERISTICS OF CHCS

Overall satisfaction is a generalization of all the characteristics that effect the satisfaction of the user. Along with overall satisfaction, the study specifically looked at the four factors that make up satisfaction: local MID staff and services, contractor services, knowledge and involvement, and information product.

1. Overall Satisfaction

The survey results indicate the users are slightly satisfied with CHCS at Naval Hospital, Charleston as a whole. The overall satisfaction scores do not differ significantly for the various types of personnel operating the system. In other words, the different ways (modules) in which people use the system did not affect their overall perception of the system.

2. Areas of Satisfaction

All three work groups rated the local MID staff and services as quite satisfactory. This is an indication that the local MID personnel is interacting well with the system users. The users perceive the local MID is taking care of their needs.

The output of the system, or information product, is considered by the users as slightly satisfactory overall. What they receive from the system in the form of output meets their expectations.

Although the overall satisfaction scores did not differ significantly, the administrative work group displayed higher satisfaction in many areas. The slightly higher satisfaction can be traced to their higher perception of satisfaction with the training provided. This leads to higher satisfaction in participation and understanding of the system. The manner in which the administrative group personnel are

trained or assisted is producing a more positive effect on their satisfaction than the other work groups.

3. Areas of Dissatisfaction

Factors that result in user dissatisfaction or significantly lower satisfaction when compared to other factors are potential areas for concern. Further investigation into areas of dissatisfaction can provide context, history and insight for possible corrective measures.

The respondents were most dissastified with the contractor services in respect to the time for new system developement and changes to the system. Although the exact cause of this dissatisfaction cannot be determined, most likely, the user's perception of the time required for these contractor activities is much less than the reality of the situation.

4. Satisfaction with Time of System Use

The expectation is that users will become more comfortable and confident, and therefore more satisfied, with CHCS as they gain increased experince using the system. This expectation was shown true for the physician and the administrative groups. However, the ancillary work group's satisfaction with the system was lower for experienced users than the less experienced users.

C. RECOMMENDATIONS

This study showed that the short-form questionnaire developed by Baroudi and Orlikowski (1988) is an effective means to measure user information satisfaction. The survey instrument is an appropriate instrument to document user satisfaction with the CHCS at other military medical facilities as well as documenting changes in user satisfaction at Naval Hospital, Charleston at a later time.

A survey of this type is best conducted by an individual at the site. It is beneficial for the researcher to have first hand experience as a user of CHCS. Additionally, direct contact with individuals for interview by the researcher is beneficial for adding context to history.

Additional investigation should be undertaken in several areas to add context and history. A larger and clearer picture may explain the reasons why the work groups had significant differences in their reported satisfaction to the various factors. These include:

1. The administrative group's overall higher satisfaction over the other work groups
2. The physicians' lowered perception of satisfaction in almost all areas
3. The reasons for the respondents having negative perceptions of satisfaction with contractor's services
4. The reduction of satisfaction for experienced ancillary users from less experienced ancillary users

The Baroudi and Orlikowski short-form questionnaire (1988) should be used to measure UIS at other CHCS sites for comparison to the results obtained from this study at Naval Hospital, Charleston. The survey should also be conducted at a later time at Naval Hospital, Charleston to monitor for any changes in UIS.

APPENDIX A
Part A: General Information

1. Hospital Department: (Check one)
   _____ General Administration
   _____ Nursing Administration
   _____ Dietary
   _____ Emergency
   _____ Laboratory
   _____ Medical Clinic
   _____ Inpatient Nursing
   _____ Pharmacy
   _____ Radiology
   _____ Other (Specify):_____

2. Job Description: (Check one)
   _____ Corpsman (0000)
   _____ Technician
   _____ Nurse
   _____ Pharmacist
   _____ Physician
   _____ Physician Assistant
   _____ Other (Specify):_____

3. Highest Level of Education: (Check one)
   _____ High School Graduate
   _____ Some College
   _____ Bachelor's Degree
   _____ Some Graduate Work
   _____ Master's Degree
   _____ Doctoral Degree
   _____ Medical Degree
   _____ Other (Specify):_____

4. Age: _____

5. Gender: _____ Male _____ Female

6. Length of time (in months) you have used CHCS: _____

7. Have you used other computer systems before ? _____ Yes ____

8. If your answer was Yes to question 7, was it a health care information system ? _____ Yes _____ No

Part B: The Questionnaire

This section of the survey conveys your own personal feelings concerning the use of the Composite Health Care system at Naval Hospital, Charleston. Please do not attempt to analyze the questions. Remember, there are no right or wrong answers.

Please follow these instructions:

1. Check each scale in the position that describes your evaluation of the factor being described.
2. Check each scale, do not omit any.
3. Check only one position for each scale.
4. Check in the space, not between spaces. THIS, NOT THIS
   :_X_:___X___:
5. Work rapidly. Rely on your first impressions.

ANSWERS BASED ON YOUR OWN FEELINGS

1. **Relationship with the Management Information Department (MID) staff**

dissonant :___:___:___:___:___:___:___: harmonious

bad :___:___:___:___:___:___:___: good

2. **Processing of requests for changes to existing systems**

fast :___:___:___:___:___:___:___: slow

untimely :___:___:___:___:___:___:___: timely

3. **Degree of training provided to users**

complete :___:___:___:___:___:___:___: incomplete

low :___:___:___:___:___:___:___: high

4. **User's understanding of systems**

insufficient :___:___:___:___:___:___:___: sufficient

complete :___:___:___:___:___:___:___: incomplete

5. **User's feeling of participation**

positive :___:___:___:___:___:___:___: negative

insufficient :___:___:___:___:___:___:___: sufficient

6. **Attitude of the Management Information Department staff**

cooperative :___:___:___:___:___:___:___: belligerent

negative :___:___:___:___:___:___:___: positive

7. **Reliability of output information**

high :___:___:___:___:___:___:___: low

superior :___:___:___:___:___:___:___: inferior

8. **Relevancy of output information (to intended function)**

useful :___:___:___:___:___:___:___: useless

relevant :___:___:___:___:___:___:___: irrelevant

9. **Accuracy of output information**

inaccurate :___:___:___:___:___:___:___: accurate

low :___:___:___:___:___:___:___: high

10. **Precision of output information**

low :___:___:___:___:___:___:___: high

definite :___:___:___:___:___:___:___: uncertain

11. **Communication with the Management Information Department staff**

dissonant :___:___:___:___:___:___:___: harmonious

destructive :___:___:___:___:___:___:___: productive

12. **Time required for new systems development**

unreasonable :___:___:___:___:___:___:___: reasonable

acceptable :___:___:___:___:___:___:___: unacceptable

13. **Completeness of the output information**

sufficient :___:___:___:___:___:___:___: insufficient

adequate :___:___:___:___:___:___:___: inadequate

Thanks again for your cooperation

APPENDIX B

Composite Health Care System
User Satisfaction Survey

This survey is part of a study of the Composite Health Care System (CHCS) effectiveness in military hospital inpatient, outpatient and administrative settings. The purpose of the study is to obtain information about your perceptions of how well CHCS functions in your area.

Just a few minutes are required to fill out the brief general information and the 13 question survey. Your responses will be treated in complete confidentiality. The data gathered through the survey will provide valuable insights into the system's strengths and weaknesses, and assist in future development, training and use.

The success of this survey depends on receiving as many completed surveys as possible from users in all hospital areas. Your participation makes an important contribution towards this end. There are no right of wrong answers, only your candid response to each question. Please do not omit any of the questions in either section of the survey.

Please return your completed survey to LT Powell in the Pharmacy Department in the addressed envelope provided. Thank you for your cooperation.

LT L.E. Hurd, MSC
Naval Postgraduate School
Monterey, Ca

APPENDIX C-1

COMBINED RESULTS FOR DOCTORS VS ADMINISTRATIVE VS ANCILLARY

TOTAL SATISFACTION	AVERAGE	INDEX
DOCTOR	0.620879	8.07
ADMIN	1.183258	14.96
ANCILLARY	0.742475	9.65

INDIVIDUAL QUESTION RESPONSES

QUESTION	1	2	3	4	5
DOCTOR	1.380952	-0.45238	0.047619	0.142857	0.52381
ADMIN	1.897059	-0.08824	1.426471	1.411765	1.588235
ANCILARY	1.652174	-0.82609	0.184783	1.032609	0.913043
STAND DEV.					
DOCTOR	1.28694	1.328898	1.342593	1.601393	1.611515
ADMIN	1.198752	1.967916	1.586474	1.498609	1.30601
ANCILARY	1.287597	1.700735	1.803107	1.712598	1.691827

QUESTION	6	7	8	9	10
DOCTOR	1.571429	1.071429	0.571429	1.404762	0.857143
ADMIN	2.308824	1.029412	1.220588	1.117647	0.808824
ANCILARY	1.934783	0.48913	0.902174	1.097826	0.206522
STAND DEV.					
DOCTOR	1.085219	0.921104	1.399353	1.083345	0.92582
ADMIN	0.965948	1.392631	1.401977	1.766432	1.650485
ANCILARY	1.014232	1.72566	1.437793	1.576334	1.56569

QUESTION	11	12	13
DOCTOR	1.357143	-0.92857	0.52381
ADMIN	1.941176	-0.07353	0.794118
ANCILARY	1.576087	0.01087	0.478261
STAND DEV.			
DOCTOR	1.185716	1.471566	0.833391
ADMIN	1.144518	1.764629	1.550723
ANCILARY	1.178877	1.775874	1.660652

APPENDIX C-2

PHYSICIANS vs THE REST OF THE SURVEY GROUP

GENERAL	AVERAGE	INDEX
DOCTOR SAT	0.620879	8.07
STDEV	1.445	8.37
NON-DOC SAT	0.930288	12.09
STDEV	1.703	12.44

GROUPED FACTORS	A (MID)	A (CONT)	B	C
DOCTOR GROUP	1.44	-0.27	0.885714	0.065476
NON-DOC GROUP	1.86	-0.69	0.761773	0.65
DOC STDEV	1.17	1.82	1.09207	1.505041
NON-DOC STDEV	1.16	1.41	1.604875	1.856174

QUESTION	1	2	3	4	5
DOCTOR SATIS	1.380952	-0.45238	0.047619	0.142857	0.52381
NON-DOC SATIS	1.75625	-0.5125	0.7125	1.19375	1.20625
DOC STDEV	1.28694	1.328898	1.342593	1.601393	1.611515
NON-DOC STDEV	1.252654	1.849656	1.81672	1.631054	1.578539

QUESTION	6	7	8	9	10
DOCTOR SATIS	1.571429	1.071429	0.571429	1.404762	0.857143
NON-DOC SATIS	2.09375	0.71875	1.0375	1.10625	0.4625
DOC STDEV	1.085219	0.921104	1.399353	1.083345	0.92582
NON-DOC STDEV	1.008123	1.61039	1.426997	1.654409	1.624837

QUESTION	11	12	13
DOCTOR SATIS	1.357143	-0.92857	0.52381
NON-DOC SATIS	1.73125	-0.025	0.6125
DOC STDEV	1.185716	1.471566	0.833391
NON-DOC STDEV	1.174798	1.766032	1.617466

APPENDIX C-3

PHYSICIANS vs THE REST OF THE STUDY GROUP

CALCULATED T-VALUE

QUESTION	T-VALUE	
1	-1.196	
2	0.169	
3	-1.869	
4	-2.666	*
5	-1.734	
6	-1.991	*
7	1.313	
8	-1.353	
9	0.998	
10	1.459	
11	-1.289	
12	-2.399	*
13	-0.241	

FACTOR	
A	-1.467
MID	
A	0.982
CONTRACTOR	
B	-0.334
C	1.331

OVERALL 1.397

* SIGNIFICANT AT ALPHA = 0.05

APPENDIX C-4

ANCILLARY vs THE REST OF THE SURVEY GROUP

GENERAL	AVERAGE	INDEX
ANCIL SATIS	0.742475	9.65
NON-ANCIL SATIS	0.967832	12.6
ANCIL STDEV	1.722284	11.7
NON-ANCIL STDEV	1.595243	11.8

GROUPED FACTORS	A (MID)	A (CONT)	B	C
ANCIL GROUP	1.72	-0.41	0.634783	0.328804
NON-ANCI GROUP	1.82	-0.32	0.935614	0.697727
ANCIL STDEV	1.17	1.78	1.621374	1.874259
NON-ANCI STDEV	1.18	1.73	1.395514	1.725329

QUESTION	1	2	3	4	5
ANCILLARY	1.652174	-0.82609	0.184783	1.032609	0.913043
NON-ANCILLARY	1.7	-0.22727	0.9	0.927273	1.181818
ANC ST DEV	1.287597	1.700735	1.803107	1.712598	1.691827
NON-ANC ST DEV	1.252887	1.753942	1.636454	1.65185	1.527616

QUESTION	6	7	8	9	10
ANCILLARY	1.934783	0.48913	0.902174	1.097826	0.206522
NON-ANCILLARY	2.027273	1.045455	0.972727	1.227273	0.827273
ANC ST DEV	1.014232	1.72566	1.437793	1.576334	1.56569
NON-ANC ST DEV	1.070532	1.229502	1.430077	1.542422	1.413299

QUESTION	11	12	13
ANCILLARY	1.576087	0.01087	0.478261
NON-ANCILLARY	1.718182	-0.40909	0.690909
ANC ST DEV	1.178877	1.775874	1.660652
NON-ANC ST DEV	1.189648	1.70426	1.325442

APPENDIX C-5

ANCILLARY vs THE REST OF THE STUDY GROUP

CALCULATED T-VALUE

QUESTION	T-VALUE	
1	-0.18	
2	-1.653	
3	-1.98	*
4	0.299	
5	-0.795	
6	-0.423	
7	-1.768	
8	-0.235	
9	-0.396	
10	-1.984	*
11	-0.572	
12	1.151	
13	-0.674	
FACTOR		
A	-0.406	
MID		
A	-0.245	
CONTRACTOR		
B	-0.948	
C	-0.976	
OVERALL	-1.197	

* SIGNIFICANT AT ALPHA = 0.05

APPENDIX C-6

ADMINISTRATION vs THE REST OF THE SURVEY GROUP

GENERAL	AVERAGE	INDEX
ADMIN SAT	1.182127	14.96
NON-ADMIN SAT	0.704363	12.94
ADMIN STDEV	1.6444	9.16
NON-ADMIN STDEV	1.645581	10.72

GROUPED FACTORS	A (MID)	A (CONT)	B	C
ADMIN GROUP	2.05	-0.09	0.994118	1.084559
NON-ADMIN GROUP	1.63	-0.8	0.664463	0.244403
ADMIN ST DEV	1.12	1.86	1.559052	1.742729
NON-ADMIN ST DEV	1.18	1.68	1.486632	1.770465

QUESTION	1	2	3	4	5
ADMIN	1.897059	-0.08824	1.426471	1.411765	1.588235
NON-ADMIN	1.567164	-0.70896	0.141791	0.753731	0.791045
ADMIN STDEV	1.198752	1.967916	1.586474	1.498609	1.30601
NON-ADMIN STDEV	1.265863	1.751332	1.746904	1.676404	1.605592

QUESTION	6	7	8	9	10
ADMIN	2.308824	1.029412	1.220588	1.117647	0.808824
NON-ADMIN	1.820896	0.671642	0.798507	1.19403	0.410448
ADMIN STDEV	0.965948	1.392631	1.401977	1.766432	1.650485
NON-ADMIN STDEV	1.04371	1.498369	1.430456	1.555407	1.512961

QUESTION	11	12	13
ADMIN	1.941176	-0.08824	0.794118
NON-ADMIN	1.507463	-0.28358	0.492537
ADMIN STDEV	1.144518	1.764629	1.550723
NON-ADMIN STDEV	1.183936	1.74471	1.487448

APPENDIX C-7

ADMINISTRATION vs THE REST OF THE STUDY GROUP

CALCULATED T-VALUE

QUESTION	T-VALUE
1	1.259
2	1.614
3	3.599 *
4	1.929
5	2.503 *
6	2.275 *
7	1.161
8	1.411
9	-0.221
10	1.213
11	1.759
12	0.53
13	0.949
FACTOR	
A	1.719
MID	
A	1.935
CONTRACTOR	
B	1.036
C	2.265 *
OVERALL	0.938

* SIGNIFICANT AT ALPHA = 0.05

APPENDIX C-8

SATISFACTION BASED ON TIME ON THE SYSTEM

OVERALL

# PEOPLE	TIME OF USE	AVG SAT
28	1 TO 5	11.64286
36	6 TO 11	11.84722
37	>= 12	10.37838
101		

ADMINISTRATION

# PEOPLE	TIME OF USE	AVG SAT
8	1 TO 5	8.8125
9	6 TO 11	17.4375
17	>= 12	17.36111
34		

ANCILLARY

# PEOPLE	TIME OF USE	AVG SAT
12	1 TO 5	16.91667
19	6 TO 11	11.5
15	>= 12	1.533333
46		

DOCTORS

# PEOPLE	TIME OF USE	AVG SAT
8	1 TO 5	6.5625
8	6 TO 11	6.375
5	>=12	13.2
21		

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